# V. An International Perspective

Nuclear weapons materials, parts, and production technologies are fundamentally the same worldwide. The wastes that nuclear weapons industries produce are essentially the same as well. At present, five nations are considered the "declared" nuclear weapons states: the United States, Russia, Britain, France, and China.

About 98 percent of nuclear weapons production occurred in the United States and the former Soviet Union, and the quantities of waste and contamination in those countries correspond roughly to the total number of weapons produced. Most of the waste and contamination from nuclear weapons production in these countries resulted from routine operations, rather than from accidents. In Britain, France, and China, waste accumulations are smaller.

Although nuclear weapons were deployed in several Soviet republics, all the major facilities of the former Soviet nuclear weapons complex are in Russia, except for a nuclear test site and a uranium metallurgy plant, both in Kazakhstan. The Russian production plants are similar in number and scale to those of the United States, but the complex in Russia was organized somewhat differently. Furthermore, Russian production reactors were also used to generate electricity and heat for civilian uses and for this reason were not shut down after the arms race ended.

Ironically, the Russian nuclear weapons complex now has less waste in storage than does the United States because large quantities of its high-level waste (as much as 1.7 billion curies) were poured into rivers and lakes or injected deep underground rather than stored in tanks. Widespread waste discharges have left the Russians with much larger areas of contamination than those in the United States.


**Tomsk-7** is a Russian plutonium processing facility in Siberia. It is the site of plutonium-production reactors and chemical separation plants, much like the Hanford and Savannah River Sites in the United States. *Near the city of Tomsk, Russia. April 20, 1993.*

**Women from the village of Muslyumovo in the southern Ural Mountains** stand on the banks of the Techa River to watch a group of Westerners take radiation readings. Liquid high-level radioactive wastes from the chemical separation of plutonium were dumped directly into the river during the 1950s. Radiation levels today are 30 to 60 times higher than natural background. *Southern Urals, Chelyabinsk Region, Central Russia. May 23, 1992.*

## Worldwide Cooperation

With the end of the Cold War, scientists and policymakers around the world are exchanging information and experiences in waste management, environmental cleanup, and the development of necessary technologies. For example, U.S. and Russian scientists are working together to develop chemical separation techniques for treating radioactive waste, technologies and methods for enhancing the characterization of sites requiring cleanup, and advanced thermal technologies for treating mixed waste. American scientists are learning a great deal from French, British, German, Japanese, Belgian, and Russian waste-vitrification projects. Representatives from the Department of Energy have visited the Capenhurst facility in Great Britain to learn more about the British experience in decontaminating and dismantling its gaseous-diffusion plant.

## Safe Management of Nuclear Materials

In addition to international cooperation on environmental issues, the United States is working with other nations to reduce the proliferation threat of nuclear weapons and their components. Joint projects with Russia are helping the Russian government ensure that crucial materials for nuclear weapons are accounted for and well guarded. In 1991, the United States began a program to assist the Russians in dismantling their nuclear weapons and in managing their stockpiles of plutonium and highly enriched uranium as safely and securely as possible. Known as the Nunn-Lugar program after the senators who sponsored it, the program has already authorized funds for designing more secure, state-of-the-art storage vaults for Russian nuclear materials.

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The Department of Energy has also played a key supporting role in efforts to secure weapons-grade nuclear materials worldwide. The Department's Reduced Enrichment Research and Test Reactor program is aimed at eliminating international commerce in highly enriched uranium fuel for reactors–a material that could be diverted and used to make nuclear weapons. The Department is evaluating the renewal of this "take-back" policy through an environmental impact statement. The program asks the participating nations to return the highly enriched uranium reactor fuel that the United States originally supplied to them. In exchange, the United States would assist the participating countries in converting their reactors to use low-enrichment fuel, which is not suitable for weapons. The return of this nuclear material to the United States would significantly diminish the world's trade in weapons-usable uranium.

The dismantlement of surplus weapons and plants also can increase trust between the United States and its former Cold War adversaries. Surplus plutonium and highly enriched uranium in the United States and Russia are being opened up to international monitoring. Representatives of the International Atomic Energy Agency and the Russian government have already toured key U.S. production facilities at Hanford, Rocky Flats, and Oak Ridge.

## New Attitudes

Nuclear weapons production has been veiled in secrecy worldwide since its beginnings half a century ago. During the Cold War, our national security strategy was based on deterring a large-scale Soviet attack by maintaining a large nuclear arsenal.

The definition of "national security" is now expanding to include other concerns: the environment, human health, the global economy, and the spread of nuclear weapons. Understanding these new missions, countries are sharing information and opening their once-secret facilities. Through such sharing, scientists, engineers, and policymakers can build trust; reduce environmental, safety, and health risks more effectively; and decrease the threat of nuclear weapons proliferation. Such alliances are forming the basis of a new world security.

## The Soviet Nuclear Waste Legacy

The examples below provide perspective on the environmental legacy of nuclear weapons production in the former Soviet Union.

**Techa River Contamination.** The Techa River flows past the Mayak plutonium-production complex in the southern Ural Mountains. From 1949 to 1951, the Soviets pumped liquid high-level radioactive waste directly into the river. Without telling the residents why, the Soviet authorities evacuated about 8,000 people from 20 villages.

**Lake Karachai.** The contamination of the Techa River ended the practice of dumping high-level waste directly into the river. From 1948 until the late 1950s, engineers at Mayak dumped high-level waste into a small lake called Lake Karachai instead. Some 120 million curies of high-level waste (equal to about one-eighth of all the high-level waste generated by the U.S. complex) remains in Lake Karachai today. Workers filling in some of the reservoirs at Lake Karachai with concrete and dirt must operate their machines from shielded cabs. To this day, a person standing at some points on the lake's shore would receive a fatal dose of radiation in a few hours.

At times of drought, severely contaminated sediment from the lake's bottom dried out and was dispersed by the wind. The first such episode convinced the Soviets that this practice was unwise, and they began storing their wastes in aboveground tanks.

**Mayak Waste-Tank Explosion.** In 1957, an 80,000-gallon tank of high-level waste at Mayak exploded with a force of 5 to 10 tons of dynamite, heavily contaminating about 9,000 square miles. The average radiation dose received by some 10,000 people evacuated from the region was about 50 rem, 10 times the current annual limit for American radiation workers. Some 75 square miles remain uninhabitable today.

**Waste Pumped Underground.** As a result of the problems experienced at Mayak, other Soviet weapons-production sites began to pump high-level waste deep underground into rock formations that they believed would keep the waste from spreading or reaching the human environment. The quantity of waste thus disposed of was very large (about 1.5 billion curies), and most of the pumping occurred at the Siberian plutonium-production sites—Tomsk-7 on the Tom River and Krasnoyarsk-26 on the Yeni-sey River. The Soviets dumped other radioactive liquids into rivers and reservoirs near these sites.

**The Arctic Ocean.** Today, the Tom and Yenisey Rivers in Siberia are contaminated for hundreds of miles downstream. Some of the radioactive waste that was released into these rivers has ended up in the Arctic Ocean, where it has entered the ecosystem and endangered fisheries. Furthermore, the Soviet navy frequently dumped old submarine reactors and other highly radioactive materials directly into the Kara sea. Fallout from nuclear weapons testing on the arctic island of Novaya Zemlya has also contributed to the contamination of the Siberian arctic.